BLACK-FOOTED FERRET

Surveys on Seven Coal Occurrence Areas in Wyoming

February - September, 1979

U. S. FISH AND WILDLIFE SERVICE
AND BUREAU OF LAND MANAGEMENT

Black-Footed Ferret Surveys On Seven Coal Occurrence Areas In Wyoming

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Final Report 1980

By
Stephen J. Martin and Max H. Schroeder

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INTRODUCTION

This report summarizes results of searches made for black-footed ferrets *(Mustela nigripes)*, February-September, 1979, on lands administered by the Bureau of Land Management (BLM) in Wyoming (Fig. 1). Sites surveyed were occupied by colonies of white-tailed *(Cynomys leucurus)* and black-tailed prairie dogs *(C. ludovicianus)*, potential habitat for the endangered black-footed ferret. Section 7 of the 1973 Endangered Species Act requires that areas of potential endangered species habitat be investigated for the presence of the species before final Environmental Impact Statements are prepared and coal lease permits issued.

Surveys were conducted in Southern Wyoming in the area defined by Kuchler (1964) as the Great Basin Sagebrush Zone. This region can generally be described as an elevated plateau having a flat, treeless land surface broken by high hills, rolling terrain and isolated mountains. Characterized by low summer moisture and low snowfall, these moderately fertile lands are used mostly for livestock grazing. In areas of available water, irrigation provides suitable sites for intensive agriculture. Underlying these lands are vast deposits of coal, a resource currently subject to intensive and extensive development. Since much of the land is administered by BLM, most soil disturbance resulting from removal of coal will be on public domain.

The U.S. Fish and Wildlife Service, Denver Wildlife Research Center (DWRC) Section of Wildlife Ecology on Public Lands, conducted black-footed ferret and endangered species surveys on these lands under BLM contract (49910-MU-9-0401). Locations of coal lease sites surveyed are shown on appended maps (Appendix). The report discusses findings at the South Haystack mine site, an area located in Southwestern Wyoming surveyed intensively for the second year, and on findings on areas searched in southern and eastern Wyoming. Objectives for these studies were: 1) search prairie dog colonies on coal occurrence areas in Wyoming for presence of black-footed ferrets, and 2) refine, test and evaluate alternative search methods.

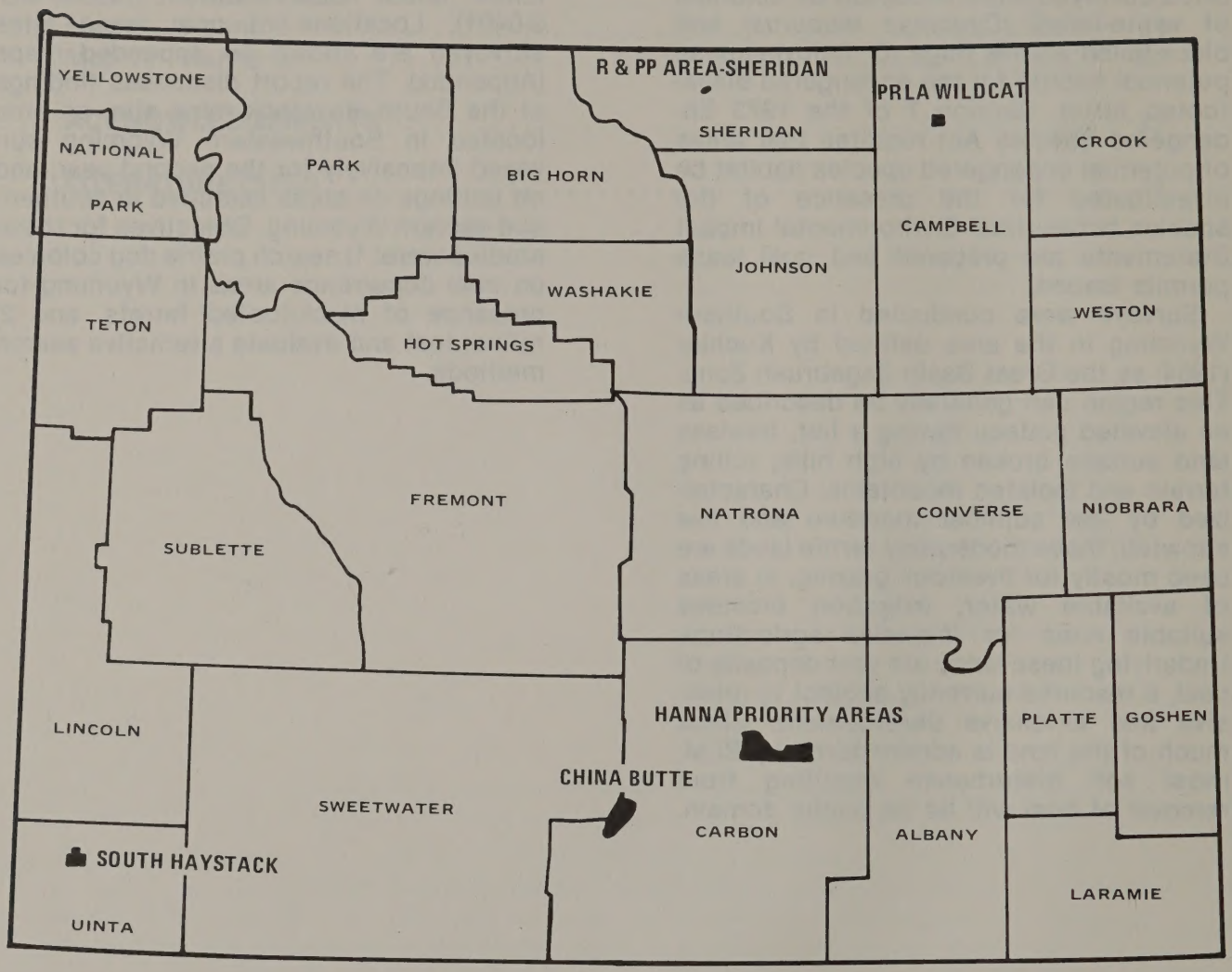


Figure 1
RELATIVE LOCATION OF SEVEN
BLACK-FOOTED FERRET SURVEY SITES IN WYOMING

METHODS

Traditional search methods developed by Henderson et al. (1969) in South Dakota for detecting black-footed ferrets in black-tailed prairie dog towns were used. Methods included searching for black-footed ferrets or their sign (scats, bones, trenches and covered prairie dog holes) while walking through prairie dog towns. Observations were made of prairie dogs in daytime to see if their activities reflected the presence of black-footed ferrets or other mustelids, and at night with spotlights to look for any active black-footed ferrets present in the towns.

A training session for team members was conducted May 29-31, 1979, to acquaint personnel with black-footed ferret survey methods. Conrad Hillman, Patuxent Wildlife Research Center, and Stephen Martin, DWRC, used visual aids found during field surveys. Sequentially, training was conducted in the field near Briggsdale, Weld County, Colorado, on four 50-acre areas, each within large black-tailed prairie dog colonies. The selected areas were flagged and just prior to searches, each was planted with randomly placed signs including three sciurid skulls, three mustelid scats, three artificially plugged prairie dog holes and three freshly made trenches, simulating the work of a black-footed ferret. Two 4-person teams were formed, each team searching one area in the morning and an alternate site in the afternoon. On the second day the teams alternated test areas. On the third day team personnel were combined to walk all four sites to count all prairie dog holes.

Summer searches of white-tailed prairie dog towns on and adjacent to the South Haystack lease tract were conducted from May 29 to August 27, 1979, by three 4-person teams. The DWRC felt this area should be examined carefully due to finding of a black-footed ferret (FWS/FCC-4059) skull and scat in 1978 (Martin and Schroeder 1978).

Surveys began May 29 on other areas in southcentral and northcentral Wyoming, prioritized by the BLM, including China Butte, Hanna 2, Recreation & Public Purpose (R&PP)-Sheridan, Preference Right Lease Application (PRLA-Wildcat), Hanna 8, and Hanna 9 (Appendix). The coal lease sites and prairie dog towns were marked on topographic maps by BLM. Attempts were made to drive all roads on each lease in search for unmapped prairie dog towns. Final field maps were prepared for each area with all known towns delineated. Acreages were determined for each prairie dog town using a standard dot grid (100 dots/sq. inch).

In the daytime boundaries of each prairie dog town were delineated and each prairie dog hole therein examined for signs of ferrets. The searches were accomplished by lining up prairie dog team members 50 to 100 feet apart, and then systematically walking through each colony. Surveyor's flagging was used to mark the outer boundary of each pass, since several passes were often necessary to complete a survey without missing any holes made by prairie dogs. All holes two inches or more in diameter were examined. These surveys were conducted in early morning, a period when ferrets are most active (Hillman 1968), and before fresh diggings from the previous night were dried out.

Crew members were provided with "tally-whackers" to tabulate numbers of prairie dog holes and binoculars to view the prairie dogs and to scan the colonies for ferrets. Data collected for each town were recorded on field forms, including legal location, date, total hours searched, number of holes counted, number of holes that were plugged, presence or absence of prairie dogs, activity of prairie dogs at time of sampling, presence or absence of ferret sign, number and kind of wildlife observed and skeletal remains encountered, and climatological, physiographic, and vegetational characteristics at the site.

Prairie dog colonies with high hole densities and those where possible ferret sign existed were selected for surveys at night. These surveys consisted of spotlighting in prairie dog towns particularly in late evening and early morning hours looking for black-footed ferrets. Although some were conducted before midnight most were conducted one to three hours before sunrise. Binoculars and window-mounted spotting scopes were used to scan prairie dog colonies at twilight and spotlight as darkness set in.

Spotlighting was conducted from stationary vantage points and from slowly moving motor vehicles using hand-held spotlights. Stationary spotlighting involved parking vehicle while looking for green eyeshine or animal movement (Fig. 2). The spotlight was used in alternate five-minute intervals, usually for a minimum of one hour per stop. When spotlighting on the move, several colonies were viewed while slowly driving along established trails or roads. Occasionally the vehicle would be parked for 20-30 minutes or stationary spotlighting.

Some colonies were not spotlighted because they were not accessible by vehicles.

Spotlight data were recorded on field forms, including time spent, presence or absence of black-footed ferrets, and wildlife observations. Particularly, the time of early morning emergence of prairie dogs from their burrows was noted.

Alternative Methods

Five other methods of searching for black-footed ferrets including snowmobile, aircraft, scent dogs, backpack spotlight, and night vision equipment were investigated during the year.

Surveys were made from two snowmobiles and from fixed-wing and helicopter aircraft during February 1979, looking over prairie dog colonies for signs of fresh soil thrown up on snow and black-footed ferret tracks (Fig. 3).

Dogs, trained to search for black-footed ferret scent by the Southwest Research Institute, San Antonio, Texas, were used on South Haystack and Hanna Review Sites 2 and 9 in summer 1979 (Fig. 4). At the Institute four dogs were taught to sit near burrows where black-footed ferret scat or urine were present and to ignore scent of other mustelid predators. Two of these dogs, handled by Gary Evans, Billings Area Office, U.S. Fish and Wildlife Service, were field tested on South Haystack and Hanna Review Sites 2 and 9.

Because some prairie dog colonies were not accessible by vehicle, the need for a portable backpack spotlight was evident. To construct one, a soft ruksack was fitted with a 12-volt wet cell battery and a hand-held spotlight was attached. This unit was used on the ground by crew members looking for green eyeshine or other animal movement on prairie dog colonies at night.

A pair of Litton Industries' night vision goggles and an Avitron nightscope were also evaluated for use in detecting ferrets or other animals at night.

Before and during winter surveys the use of aerial photography was evaluated as a tool for mapping white-tailed prairie dog colonies. Aerial photographs, 1:6,000 color infrared transparencies taken July 1978, and 1:12,000 color prints taken in October 1975, were provided by Peter Kiewit Sons' Company of the South Haystack mine site and surrounding area.

Figure 2. Long-tailed weasel illuminated by hand held spotlight.

Figure 3. Winter surveys included the use of snowmobiles.

Figure 4. Scent dogs were used to search for black-footed ferrets.

RESULTS

Training Session

Results of the training exercises showed that 75 to 94 percent (average 83 percent) of the 5,605 prairie dog holes counted in the final walk through of all four sample areas were found by crew members the first time they counted the sites. Number of holes on the four sites varied from 22-34 and averaged 28 per acre.

Success in location of planted sign varied with its relative visibility. Trenches and plugged burrows were most obvious, 96 percent of these were found. Skulls were small but relatively easy to see against the darker soil background; 71 percent of these were found. Those skulls not seen were assumed located on mounds at holes that were missed. Small weasel droppings less than 5 cm long and 1 cm wide were planted on mounds just below the rim of holes dug by prairie dogs and near the outer border of the mounds to simulate the way natural deposits would fall. Scats were most difficult of all signs to find; only 54 percent were located.

The training session proved to be a quick way of teaching crew members how to look for ferrets. We believe it was beneficial in obtaining good surveys throughout the summer and plan to use it to train members of future survey teams. Training quickly identified a need for interaction between team members and the need for careful, methodical search at and near mounds of soil piled at the holes entering the burrow systems.

South Haystack Survey

In a 15,500 acre area adjacent to South Haystack 16 white-tailed prairie dog towns were searched for signs of black-footed ferrets from May 29-August 30, 1979 (Table 1). Colonies ranged from 9-1,024 acres in size, averaging 263 acres per colony. In 1978 colonies on South Haystack ranged from 7-1,261 acres in size, and averaged 183 acres per colony (Martin and Schroeder 1978). White-tailed prairie dog colonies are not always well defined and the scattering of holes sometimes makes exact determination of colony boundaries difficult. Acreages given for colonies, then, are best estimates.

Hole Counts

Over 92,000 holes made by white-tailed prairie dogs were counted and examined during 1979 (Table 1). The mean number of holes was 22 per acre, with a range of 3-39. These were larger figures than were recorded in 1978 when the mean was 16 and the range 4-31 holes per acre (Martin and Schroeder 1979). The mean number of holes per acre recorded for 1979 was similar in size to the 22 for studies in Colorado by Tileston and Lechleitner (1966) and the 23 for investigations in Wyoming by Clark (1977).

Numbers counted in this survey may have included some holes made by species other than prairie dogs because all holes, two inches or more in diameter, were tallied and examined. Other burrowing animals observed during the survey included cottontail rabbits *(Sylvilagus* spp.*)*, Richardson's *(Spermophilus richardsonii)*, thirteen-lined *(S. tridecemlineatus)*, and Uinta *(S. armatus)* ground squirrels, and badgers *(Taxidea taxus)*. Because of difficulties in determining what animal excavated a hole, no effort was made to separate number of holes by kind of animal that made them. Fecal droppings can be used to help identify the burrowing animal, but in prairie dog colonies droppings are not always visible and they are not an unequivocal clue because of cohabitation of burrows by more than one species. In a black-tailed prairie dog colony, the occurrence of many plugged holes is considered a good indication that a ferret may be present (Hillman 1968). Plugging of burrows by black-tailed prairie dogs is not completely understood, and white-tailed prairie dogs may not behave in the same way.

A total of 441, less than 1 percent, of the holes counted in white-tailed prairie dog towns were plugged. The greatest number of plugs, 19 per 1,000, were found in June, followed by 4 per 1,000 in July, and 2 per 1,000 in August (Fig. 5). Closed holes encountered were usually plugged below the surface and the entrance to the burrow remained obvious. This plugging of holes by white-tailed prairie dogs differed from that observed for black-tailed prairie dogs in South Dakota, where the entrances were totally covered, leaving no visible sign of the entrance.

Reason for reduction of plugged holes as summer progresses is not understood. The higher occurrence in June may be a result of higher prairie dog numbers in June or due to intensive sheep grazing. Domestic sheep were often seen lying or standing on prairie dog mounds, and may have caused some plugging of burrow entrances.

Skeletal Remains

Two black-footed ferret skulls were found in 1979 at the South Haystack lease site (Fig. 6). Specimens were identified by Dr. Robert Finley, U.S. Fish and Wildlife Service, and are catalogued and housed in the museum, National Fish and Wildlife Laboratory, in Fort Collins, Colorado. The first skull, FWS/FCC-4441, was found in an 807 acre white-tailed prairie dog colony having 23 burrows per acre and located approximately 1 1/4 miles southeast of where black-footed ferret skull No. 4059 was found in 1978 (Martin and Schroeder 1978). Skull No. 4441 was severely weathered and only the posterior portion of the cranium was found (Fig. 6). It was located about 10 inches from one of two burrow entrances. No additional bones were found at the spot although a 22 caliber bullet was located in the mound of soil at the entrance of the burrow.

The second skull, No. 4442, was discovered approximately one mile east of skull No. 4059 and 1 1/4 miles northeast of skull No. 4441. It was about 400 feet east of Highway 189 in a 1,024 acre white-tailed prairie dog colony having 39 holes/acre. This skull was 12 inches from 1 of 3 burrow entrances. Examination of the mound soil revealed the lower mandibles and numerous other bones including those of a cottontail rabbit and white-tailed prairie dog. Two 22 caliber bullets were found in the mound.

During the course of the surveys, 1,972 white-tailed prairie dog skulls were examined for possible evidence of predation by black-footed ferrets, i.e., canine tooth puncture holes. Only two prairie dog skulls showed signs of possible tooth marks (Fig.7).

Skulls of other animals were found during the surveys. The most common, 14, was that of the badger. Other common species include proghorn *(Antilocapra americana)*, mule deer *(Odocoileus hemionus)*, domestic sheep *(Ovis aries)*, cattle *(Bos taurus)*, coyote *(Canis latrans)*, red fox *(Vulpes vulpes)*, domestic dog *(C. familaris)*, long-tailed weasel *(M. frenta)*, short-tailed weasels *(M. erminea)*, uinta ground squirrel, white-tailed prairie dog, cotton tail rabbit, white-tailed jackrabbit *(Lepus townsendi)*, least chipmunk *(Eutamias minimus)*, deer mouse *(Peromyscus* spp.*)*, and bushy-tailed woodrat *(Neotoma cinerea)*. Bird species include golden eagle *(Aquila chrysaetos)*, great horned owl *(Bubo virginianus)*, sage grouse *(Centrocercus urophasianus)*, swan *(Olor* spp.*)*, white-faced ibis *(Plegadis chinhi)* and starling *(Sturnis vulgaris)*.

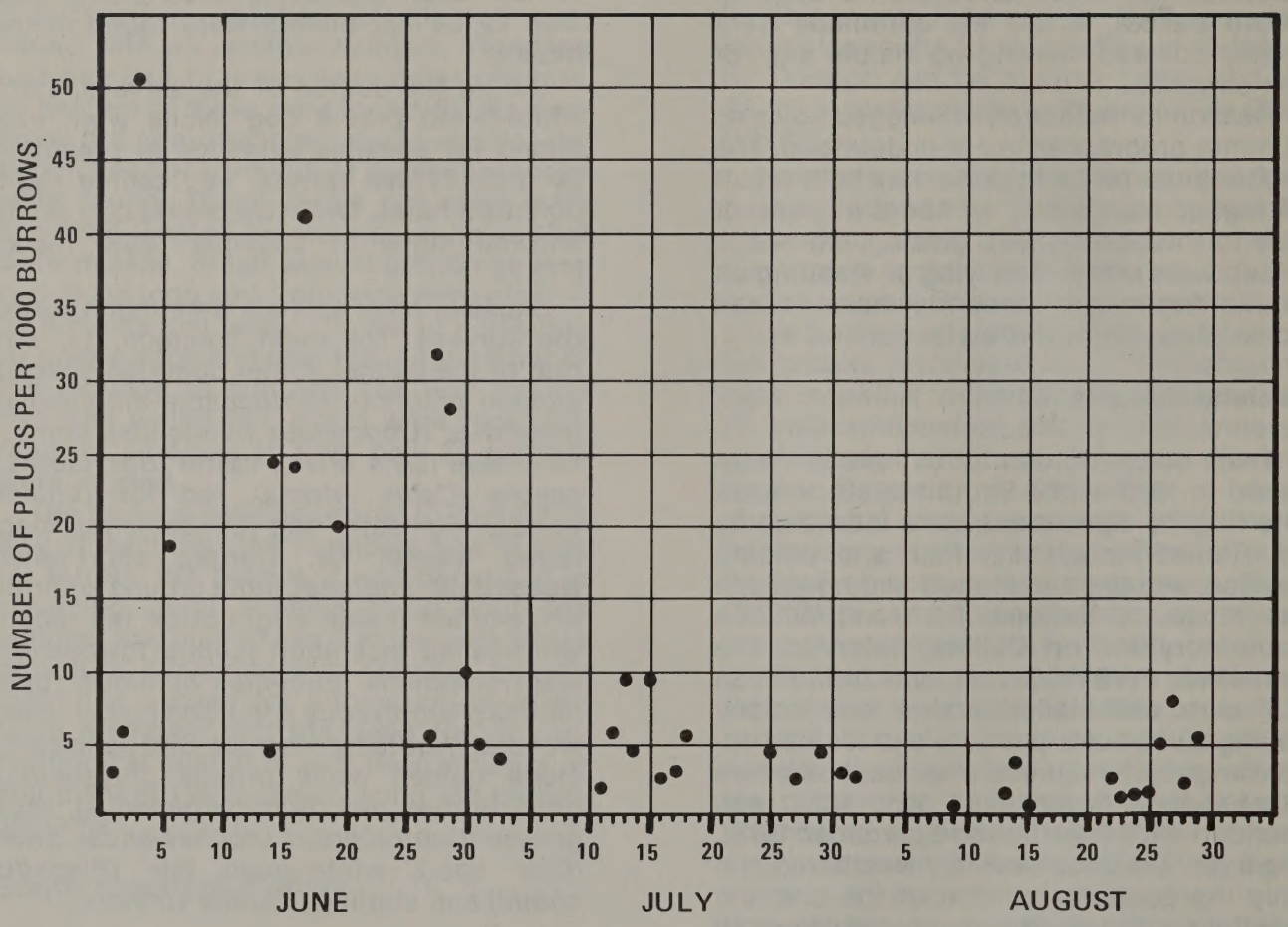


Figure 5
NUMBER OF PLUGGED WHITE-TAILED PRAIRIE
DOG BURROWS PER 1000 ON SOUTH HAYSTACK

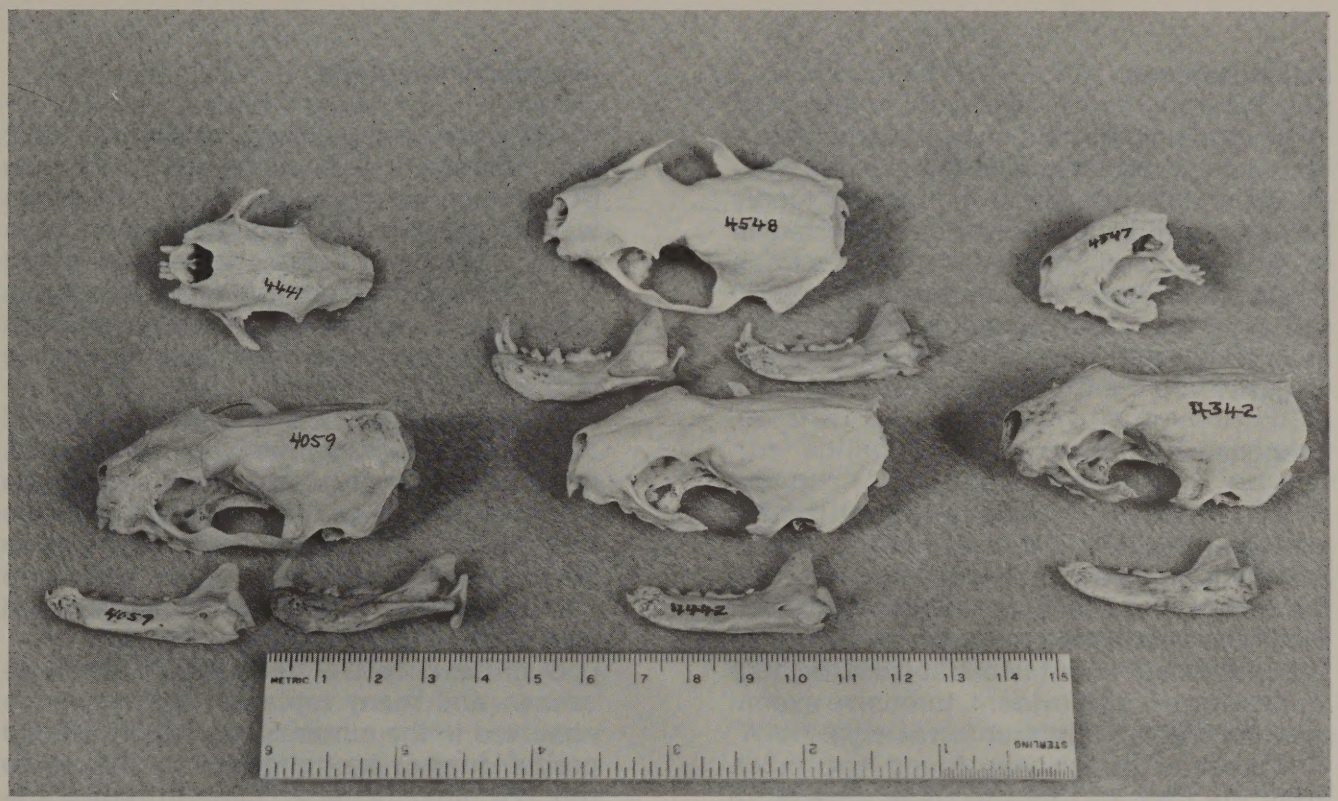


Figure 6. Black-footed ferret skulls found on white-tailed prairie dog towns in 1978 and 1979.

Figure 7. Four white-tailed prairie dog skulls from South Haystack and Hanna Review showing possible black-footed ferret tooth punctures.

Fecal Deposits

Several unidentified mustelid scats were found on South Haystack. Three scats were found about 1 mile east of the location of an unidentified mustelid scat reported in 1978 (Martin and Schroeder 1978). No fresh scats were found this year though several old scats were. These were presented for testing to the scent dogs; results were negative.

Trenches

Two possible black-footed ferret trenches were discovered during 1979. One was on a white-tailed prairie dog town where a possible ferret scat was found in 1978. Soil from the mound at this burrow entrance was pulled out about two feet from the hole but no furrow was evident. Intensive examination revealed no other ferret sign.

A second trench was found two miles from the first. At this site there were actually two trenches coming from the same burrow entrance in opposite directions. Both were about seven feet long, old and weathered. Accompanying this sign was a desiccated mustelid scat at the end of one trench.

Night Surveys

No black-footed ferrets were seen in 484 hours of searching at night. Such species as jackrabbits, sage grouse and pronghorns were most frequently seen after dark. Other mammals and birds observed at night are listed in Tables 2 and 3. One white-tailed prairie dog was observed after dark. The animal was sighted at 10:45 p.m. MST, and appeared to be attracted by the spotlight. It approached to within a few feet of the vehicle before disappearing. In two years of nighttime surveys this is the only observation ever made of a prairie dog at night.

Alternative Methods

Fifty-one hours were spent searching for signs of ferrets on snow by snowmobile on South Haystack, February 15-21, 1979.None were found. Mid-February snow conditions were marginal for detecting black-footed ferret tracks. Emergence of prairie dogs in February; also complicated observations because of the numerous tracks they made in the snow.

Snowmobile surveys revealed many dead cottontail and white-tailed jackrabbits. Few living rabbits were also found during the summer and it was evident that disease was killing ground squirrels and prairie dogs as well. One area of about 109 acres contained 168 carcasses of white-tailed jackrabbits, 1.5 per acre.

Over seventy-five fresh prairie dog carcasses and many lethargic animals were observed in the summer of 1979. Two dead prairie dogs were collected and taken to the Wyoming Disease Laboratory in Laramie. Diagnostic tests indicated one specimen had the disease tularemia, while the other was found negative for both plague and tularemia.

Winter aerial flights in a fixed-wing Cessna 185, flown at 500 feet and 60 mph, showed this was not an acceptable method to look for ferret sign on snow. A smaller aircraft flown at lower level and at reduced air speed might be more acceptable.

A supercharged Bell helicopter was flown back and forth at 40 feet and 30 mph across a sample area. This aircraft provided better viewing than fixed-wing and allowed observers to set down on possible sign. Unusual diggings were observed from the helicopter on two occasions and in both cases close examination showed them to be work of a badger.

Though winter surveys were conducted under marginal conditions, winter appears a good time to search for ferrets. Both snowmobile and helicopter provided an excellent opportunity to search large areas in a minimum of time. The surveys should be conducted in December or January when fresh snow cover (5 inches or more) is present.

Scent dogs trained to detect black-footed ferrets were used to survey approximately 2,000 acres on and adjacent to South Haystack, May 29 to June 28, (Map 1, Appendix). No black-footed ferrets were found using dogs. During these surveys several problems were encountered. The dogs were initially trained to search prairie dog colonies while on a 30-foot leash. The leash proved unacceptable because of the constant problem of tangling with vegetation. When dogs were walked without a leash, it became evident that they had not had adequate obedience training to allow free-roaming searches. Because of this lack of obedience, considerable time was spent retraining dogs for use in white-tailed prairie dog colonies.

An experimental portable backpack spotlight was developed for use on prairie dog colonies that were inaccessible by motor vehicles. On two occasions the unit was used while walking through large colonies. The walker surveyed the colony at a speed of about one mile per hour. This method allowed good coverage with a minimum of disturbance. On one occasion an observer approached to within 90 feet of two badgers before they ran. Improvement and modification of a backpack spotlight is planned prior to field work in summer 1980.

White-tailed prairie dog colonies visible on aerial photography were compared with colonies mapped in 1978. Few of the colonies surveyed in 1978 were visible on aerial photographs and additional ground truthing, conducted in February 1979, indicated the existing photography was of minimal value. The only colonies that were highly visible on photographs were those located where ground cover provided contrast to unvegetated mounds. Ground cover/burrow contrast would probably be greater during the spring or early summer and during periods after snows when ever present winds have swept snow from the mounds at the entrances to the burrows exposing the contrasting soil. It's our opinion that aerial photographs taken in winter after snowfall would provide the best visibility of prairie dog colonies.

White-tailed Prairie Dog Observations

Surveys in February revealed the presence of white-tailed prairie dogs above ground on February 15. At this time several hundred prairie dogs were observed on 8-12 inches of snow. Numerous tracks leading from hole to hole suggested they were probably adult males searching for females. Below freezing temperatures did not appear to affect prairie dogs as three of six days' maximum temperatures were below 32° F. On one day, February 17, the Peter Kiewit Sons' mine site recorded a maximum temperature at only 27° F.

Above ground activity in February has generally been considered unusual for white-tailed prairie dogs. Clark (1977) studied a white-tailed prairie dog colony near Laramie, Wyoming (elevation 7,136 feet) that was active for about 8 1/2 months while Tileston and Lechleitner (1966) reported white-tailed prairie dogs in northern Colorado (elevation 8,069 feet) active only 7 months. However, biologists working for Peter Kiewit Sons' (unpublished data) have observed white-tailed prairie dogs above ground from December 1977 to December 1978 at the South Haystack lease tract (elevation 7,336 feet).

Observations of white-tailed prairie dogs to detect similarities or differences in behavior between white- and black-tailed prairie dogs in the presence of predators was continued during the year. Henderson, et al. (1969) reported that black-tailed prairie dogs exhibit upright or an alarm posture in response to predators was reported by Hillman (1968). During field surveys both alarm behavior and aggression were observed by white-tailed prairie dogs. While observing a prairie dog town for black-footed ferrets one morning, a long-tailed weasel was seen entering the colony. At first notice of the weasel, alarm calls were issued by five prairie dogs standing erect on several mounds about twenty-five feet from the invading mustelid. The weasel crossed the town running within three feet of a large prairie dog. The prairie dog pursued the weasel and actively ran it into the sagebrush. Pursuit by the prairie dog stopped when the weasel entered the sagebrush.

Emergence times for white-tailed prairie dogs were determined. Earliest morning observations were recorded from June through August (Fig. 8). Prairie dogs were not seen before sunrise; then usually emerged 20 to 30 minutes after the sun rose.

Other Wildlife

Listing of 28 species of mammals, 54 birds, and 3 reptiles and amphibians encountered during surveys are shown in Tables 2, 3, and 4. Species lists were developed from visual observations, skeletal remains, or sign. The greater number of wildlife species on South Haystack than on the other areas is a probable reflection of when, in time, the sampling was done.

On August 26 a single burrowing owl was seen and probable nest found in a 51-acre white-tailed prairie dog colony. These owls are considered rare in Wyoming (Wyoming Game and Fish Department 1977).

Statewide Survey

Surveys for black-footed ferrets on other coal occurrence areas in the state were initiated May 30 and concluded September 26, 1979. In these investigations both white- and black-tailed prairie dog colonies were searched. White-tailed prairie dogs were found on China Butte and Hanna Review sites while the R&PP-Sheridan and PRLA-Wildcat sites contained colonies of black-tailed prairie dogs. Because of conflicts in access that developed on PRLA-Wildcat lands, the survey was not completed. Six BLM prioritized sites covering a land area of nearly 139,000 acres were examined, however. Sixty-five white-tailed prairie dog colonies totalling 6,526 acres and 7 black-tailed colonies totalling 1,434 acres were looked at (Table 1). The smallest acreage of white-tailed colonies occurred on China Butte where 157 acres were surveyed. Hanna 2 had the greatest acreage, 4,192, while Hanna 9 had the greatest range of colony size 1,805 acres averaging 72 acres/colony. Average size for black-tailed colonies was 205 acres. Average size for white-tailed colonies was smaller averaging only 100 acres. These findings agree with other studies which indicate that average black-tailed colonies are larger than the average white-tailed colonies (Tileston and Lechleitner 1966).

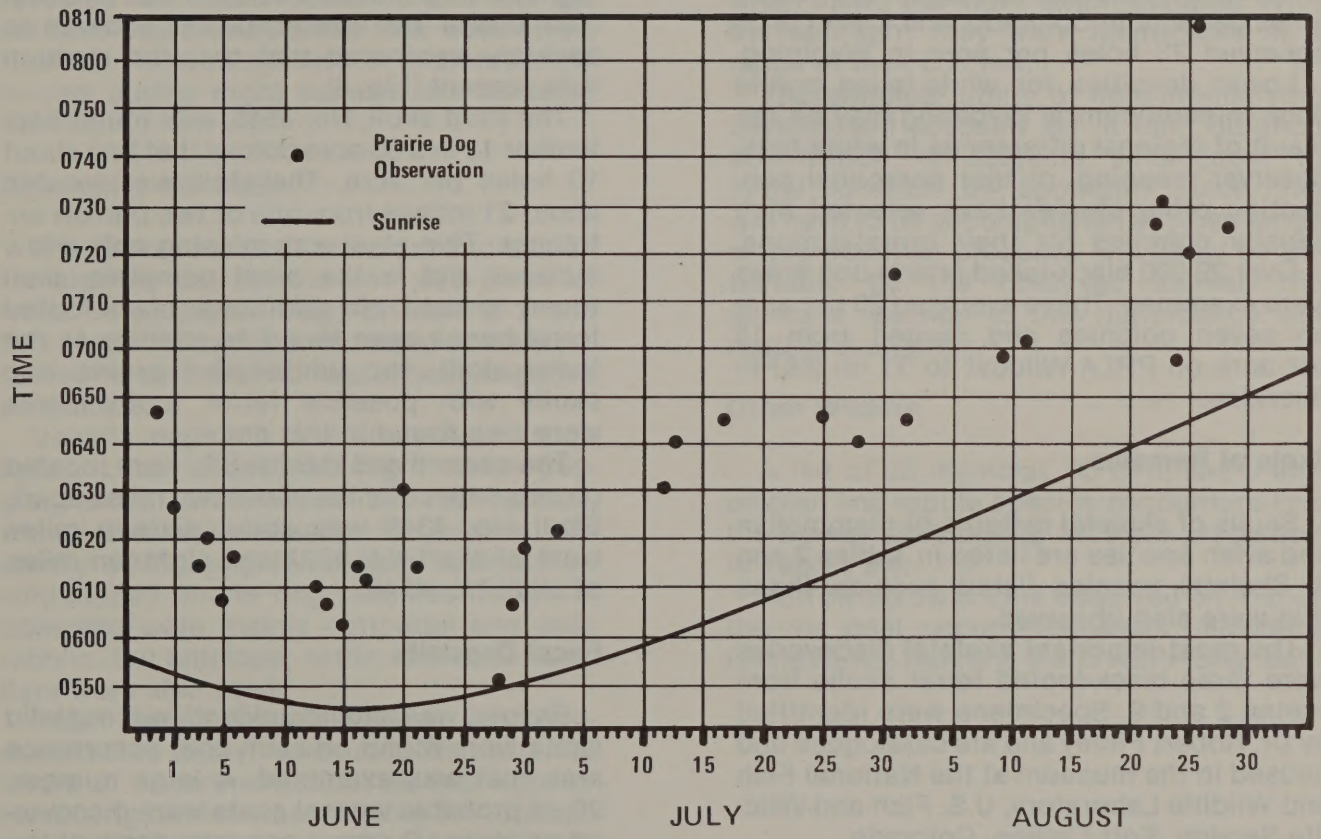


Figure 8
TIME OF EMERGENCE (MDT) OF
WHITE-TAILED PRAIRIE DOGS ON SOUTH HAYSTACK

Hole Counts

Over 37,000 white-tailed and 29,000 black-tailed prairie dog burrow entrances were examined during statewide surveys (Table 1). Mean number of holes per acre for five white-tailed leases ranged from five on China Butte to eight on Hanna 9. Mean number of holes per acre for 65 colonies was six.

Findings in 1978 for these same areas ranged from 3-7 holes per acre (Martin and Schroeder 1978). Findings for both years are low when compared to investigations. Tileston and Lechleitner (1966) reported 22 holes per acre in Colorado, and Clark (1977) observed 23 holes per acre in Wyoming.

Lower densities for white-tailed prairie dogs in southcentral Wyoming may be the result of regional differences in white-tails, observer mapping, or that personnel conducting other studies have selected high density colonies for their investigations.

Over 29,000 black-tailed prairie dog holes were examined. These averaged 20 per acre on seven colonies and ranged from 18 per acre on PRLA-Wildcat to 31 on R&PP-Sheridan.

Skeletal Remains

Skulls of skeletal remains of mammalian and avian species are listed in Tables 2 and 3. Skeletal species listed exclude those that were also observed.

The most important skeletal discoveries were three black-footed ferret skulls from Hanna 2 and 9. Specimens were identified by Dr. Robert Finley and are catalogued and housed in the museum at the National Fish and Wildlife Laboratory, U.S. Fish and Wildlife Service, Fort Collins, Colorado.

The first skull (FWS/FCC-4342) was found on June 27 on Hanna 2 about one mile west of Seminoe Reservoir. The cranium and half of lower mandible were found on a 188-acre white-tailed colony with a hole density of three per acre (Fig. 6). The skull was located about one foot from one of three burrow entrances. Careful examination of soil in the mound revealed a second mandible and one canine tooth.

The second and third black-footed ferret skulls were found on Hanna 9. The second skull, No. 4527, was discovered September 5 on a 285-acre colony having a density of eight holes per acre. The skull was two feet from one of four hole entrances and was so severely weathered that only the rostrum was present (Fig. 6).

The third skull, No. 4548, was found September 12 in a 30-acre colony that had about 10 holes per acre. The skull was located about 21 inches from one of two burrow entrances. This skull was missing only a few incisors and is the most complete skull found to date. No additional black-footed ferret bones were found. In addition to the ferret skull, two white-tailed prairie dog skulls with possible ferret tooth marks were also found in this colony.

The second and third skulls were located on separate colonies about two miles apart. Skull No. 4342 was about sixteen miles west of skull No. 4527 and eighteen miles of skull No. 4548.

Fecal Deposits

Badger, weasel and unidentified mustelid scats were found on each coal occurrence area that was examined. A large number, 20, of probable weasel scats were discovered on Hanna 9, about one mile north of the area where black-footed ferret skull No. 4548 was found.

Three possible black-footed ferret scats found on Hanna 2 were tested with scent dogs. Neither dog responded positively to any of the scats, probably because each scat was dry and no fresh material existed.

Trenches

No black-footed ferret trenches were discovered during statewide surveys. The BLM indicated a possible trench existed on R&PP-Sheridan, but surveys on this site did not reveal any, though several plugged burrows were found. Heavy rain storms and digging by black-tailed prairie dogs probably accounted for its disappearance.

Night Surveys

Nighttime surveys totalling 514 hours revealed no black-footed ferrets on the six coal occurrence areas that were investigated. Thirteen species of mammals observed during night surveys are listed in Table 2.

Alternative Methods

The two scent dogs were used to search for black-footed ferrets on 1,825 acres of white-tailed prairie dogs on Hanna 2 and 200 acres on Hanna 9. Mustelid scats were tested on several colonies, all with negative responses.

Vehicle-mounted and hand-held spotlights, Litton Industries' night vision goggles, and a Javelin Model 226 night scope, were informally evaluated for relative efficiency at locating ferret-sized animals on white-tailed prairie dog colonies. Subjects observed were mainly cottontail and jackrabbits, but antelope, cattle and crew members were also used.

Team leader Thomas Dahmer, who conducted this study, concluded that after 30 hours of experimentation, neither light-intensifying device was suitable for location and identification of ferret-sized animals at distances over 65+ feet in sagebrush or mid-grass cover. In short grass or on bare soil, rabbits could be identified up to a distance of 115 feet. Their identification was greatly aided by the large, conspicuous ears and locomotion patterns characteristic of lagomorphs. Intense moonlight also helped in detection and identification of smaller mammals. Cattle and pronghorns could be located and identified at distances up to 800 feet with spotlights, but their presence was not detectable at that range with light-intensifying devices. On one occasion, in an area of shaded moonlight, recumbent cattle were distinguishable as such only at distances less than 200 feet when using the night vision goggles. With the spotlight they were identifiable at a range of over 650 feet.

The principal utility of light-intensifying devices will probably be in long duration observation of subjects subsequent to initial location by spotlight. Since this will have to be accomplished at close range where observer presence will likely be detectable by the observed animal, the animal's reaction to this disturbance will require evaluation.

Other Wildlife

A list of 25 mammal, 30 bird, and 9 amphibian and reptile species encountered on the survey sites during 1979 are presented in Tables 2-4.

Burrowing owls were observed on four of the six coal occurrence areas, including China Butte, Hanna 2, 9 and R&PP-Sheridan.

SUMMARY AND DISCUSSION

In 1979 field crews spent over 2,800 hours conducting day and nighttime searches for black-footed ferrets or their sign on seven coal occurrence areas in Wyoming. In this time 88 black- and white-tailed prairie dog colonies, covering 12,178 acres and containing 159,184 burrows, were examined.

No live black-footed ferrets were seen. The most important sign relating to the presence of black-footed ferret were five skulls. Two skulls (Nos. 4441 and 4442) were discovered on South Haystack within 1 1/2 miles of skull No. 4059, found in 1978. Skulls from South Haystack were located on white-tailed prairie dog colonies of 147-1024 acres having burrow densities of 23-39 per acre. Three skulls, Nos. 4342, 4547 and 4548 were found on Hanna 2 and 9. On the Hanna review sites skulls were found on colonies ranging from 30-285 acres with burrow densities of 3-10 per acre. These skulls are an important contribution to our knowledge about the occurrence of black-footed ferrets on white-tailed prairie dog colonies in Wyoming and indicate importance of surveying all white-tailed prairie dog colonies, regardless of acreage or burrow density.

Alternate methods for finding black-footed ferrets were evaluated.

Surveys in winter using snowmobile and aircraft were tried and found effective. These winter investigations start late, so additional work beginning earlier in the winter season will be necessary before a final evaluation of the effectiveness of these methods can be made.

Dogs trained to find ferret scat and urine were evaluated on both white- and black-tailed prairie dog colonies. Dogs are believed an important new tool for detecting black-footed ferrets or their sign, but additional training under actual field conditions is considered necessary to produce acceptable field dogs.

Use of night vision devices was evaluated and found lacking. Night vision goggles and scopes did not provide adequate resolution to locate and observe ferret-sized animals at a reasonable distance and were considered inferior to spotlights as searching tools. These devices may prove useful for observations of animals under natural light conditions if one is first located using conventional spotlight techniques. To survey prairie dog colonies not approachable by vehicle development of a backpack spotlight was started. A backpack unit developed in 1979 proved too heavy and battery leakage was a problem. Use of a lighter pack frame and sealed battery will be evaluated during the winter season.

RECOMMENDATIONS

1. Map all white- and black-tailed prairie dog colonies on lands administered by the BLM in Wyoming for future black-footed ferret surveys.

2. Provide survey teams the flexibility to search non-lease public lands where recent sightings of black-footed ferrets have occurred.

3. Solicit black-footed ferret sightings from the public and establish a center that will receive and compile all recent ferret sightings, their location, and source of information for use by search teams when trying to locate the reported animal.

4. Periodically monitor sites where black-footed ferret skulls have been found to determine if this animal still exists on these areas. Maintain active prairie dog colonies where the skulls occurred and in the vicinity as suggested in the black-footed ferret recovery plan.

5. Familiarize field personnel with black-footed ferret search techniques through attendance at workshops and consultation with field personnel.

6. Continue to refine existing black-footed ferret survey techniques and to evaluate newer methods, including use of trained dogs, studies of prairie dog behavior in presence of predators, remote sensing devices and isolation of odor using gas chromotography.

Table 1. Black-footed ferret survey areas, their size, and number of white- and black-tailed prairie dog colonies surveyed in Wyoming, summer 1979

Area	South Haystack	China Butte	Hanna #2	R&PP Sheridan	PRLA Wildcat	Hanna #8	Hanna #9	TOTAL		GRAND TOTAL
Prairie dogs	white-tailed	white-tailed	white-tailed	black-tailed	black-tailed	white-tailed	white-tailed	white-tailed	black-tailed	
Acreage	15,500	39,680	41,600	560	4,500	26,240	26,800	149,900	5,060	154,960
Colonies	16	4	26	1	6	10	25	81	7	88
Colony acreage (total)	4,218	157	4,192	268	1,166	377	1,800	10,744	1,434	12,178
Acreage (range)	9-1,024	24-90	3-733	268	7-888	5-144	1-805	-	-	-
Acreage (mean)	264	39	161	268	194	377	72	133	205	-
Holes	92,788	852	19,865	8,254	20,961	2,233	14,231	129,969	29,215	159,184
Holes/acre (range)	3-39	1-11	5-17	31	3-45	2-12	3-31	-	-	-
Holes/acre (mean)	22	5	5	31	18	6	8	12.1	20.4	-
Plugs	441	0	46	19	44	4	69	560	63	623
Day survey person-hours	554	149	205	54	170	48	182	1,138	224	1,362
Night survey person-hours	484	3	284	55	125	42	185	998	180	1,178
Binocular scan person-hours	154	0	55	12	23	9	14	232	35	267
Dog survey (acreage)	2,000	0	1,825	0	0	0	200	4,025	0	4,025
Winter (total) person-hours	51	0	0	0	0	0	0	51	0	51
Prairie dog skulls examined	1,972	0	154	98	146	25	135	2,286	244	2,530
Black-footed ferret skulls found	2	0	1	0	0	0	2	5	0	5

Table 2. Mammals encountered on coal lease sites.

Area	South Haystack	China Butte	Hanna #2	R&PP Sheridan	PRLA Wildcat	Hanna #8	Hanna #9
Survey Period - 1979	5/30-8/30	5/30-6/6	6/13-6/30 9/19-9/26	7/1-7/3 7/11-7/13	7/14-8/1	8/8-8/16	8/12-8/16 9/4-9/19
Unidentified bat	1				1		
Short-tailed weasel *(Mustela erminea)*	1*						
Long-tailed weasel *(Mustela frenata)*	1*	1*			1	3	1*
Black-footed ferret *(Mustela nigripes)*	2		2				2
Mink *(Mustela vison)*					1		
Badger *(Taxidea taxus)*	1*	1	1*		1*	3	1*
Striped skunk *(Mephitis mephitis)*	1*		1*		1*	1*	1*
Coyote *(Canis latrans)*	1*	1	1*			1	1*
Domestic dog *(Canis familiaris)*	2						
Red fox *(Vulpes vulpes)*	1*						
Bobcat *(Lynx rufus)*	2				1		
Feral cat *(Felis catus)*			1*				
Yellow-bellied marmot *(Marmota flaviventris)*	1						
Black-tailed prairie dog *(Cynomys ludovicianus)*				1	1		
White-tailed prairie dog *(Cynomys leucurus)*	1*	1	1			1	1
Richardson's ground squirrel *(Spermophilus richardsonii)*		1	1			1	
Uinta ground squirrel *(Spermophilus armatus)*	1						1
Thirteen-lined ground squirrel *(Spermophilus tridecemlineatus)*		1		1	1	1	
Least chipmunk *(Eutamias minimus)*	1					1	1
Northern pocket gopher *(Thomomys talpoides)*	3		2				2
Ord kangaroo rat *(Dipodomys ordi)*			1*				

Table 2. (Continued)

Area	South Haystack	China Butte	Hanna #2	R&PP Sheridan	PRLA Wildcat	Hanna #8	Hanna #9
Survey Period - 1979	5/30-8/30	5/30-6/6	6/13-6/30 9/19-9/26	7/1-7/3 7/11-7/13	7/14-8/1	8/8-8/16	8/12-8/16 9/4-9/19
Beaver *(Castor canadensis)*	1						
Deer mouse *(Peromyscus spp.)*	1*		1*		1*	1*	1*
Bushy-tailed woodrat *(Neotoma cinerea)*	1*						
Vole *(Microtus spp.)*	1*						1
Muskrat *(Ondatra zibethica)*	1*						
Porcupine *(Erethizon dorsatum)*	1*				1*		
White-tailed jackrabbit *(Lepus townsendi)*	1*	1*	1*	1*	1*	1*	1*
Cottontail *(Sylvilagus spp.)*	1*	1	1*		1*	1*	1*
Mule deer *(Odocoileus hemionus)*	1*		1*	1	1*	1*	
Pronghorn *(Antilocapra americana)*	1*	1*	1*		1*	1*	1*
Domestic sheep *(Ovis aries)*	1*						
Feral horse *(Equus caballus)*	1*	1					1*
Domestic cattle *(Bos taurus)*	1*						
N =	28	10	14	4	14	13	15

1 Mammals observed
2 Skeleton found
3 Sign found (i.e., scat, digging, etc.)
* Mammals observed at night

Table 3. Birds encountered on coal lease sites.

Area	South Haystack	China Butte	Hanna #2	R&PP Sheridan	PRLA Wildcat	Hanna #8	Hanna #9
Survey Period - 1979	5/30-8/30	5/30-6/6	6/13-6/30 9/19-9/26	7/1-7/3 7/11-7/13	7/14-8/1	8/8-8/16	8/12-8/16 9/4-9/19
Common loon *(Gavia immer)*			1				
Eared grebe *(Podiceps caspicus)*	1						
Swan *(Olor* spp.*)*	2						
White pelican *(Pelecanus erythrorhynchos)*							1
Canada goose *(Branta canadensis)*	1						
Mallard *(Anas platyrhynchos)*	1						
Wigeon *(Anas americana)*	1						
Gadwall *(Anas sterepera)*	1						
Teal *(Anas* spp.*)*	1						
Common merganser *(Mergus merganser)*			1		1		
Turkey vulture *(Cathartes aura)*			1				
Accipiter spp.	1						
Marsh hawk *(Circus cyaneus)*	1	1	1*	1		1	1
Ferruginous hawk *(Buteo regalis)*	1*	1	1*		1		1
Red-tailed hawk *(Buteo jamaicensis)*	1		1				
Swainson's hawk *(Buteo swainsoni)*	1						
Golden eagle *(Aquila chrysaetos)*	1*	1*	1*	1	1	1	1*
Prairie falcon *(Falco mexicanus)*	1*		1		1		1
American kestrel *(Falco sparverius)*	1		1*		1*	1*	1
Sage grouse *(Centrocercus urophasianus)*	1*	1*	1*	1		1*	1*
Great blue heron *(Ardea herodias)*					1		1*

Table 3. (Continued)

Area	South Haystack	China Butte	Hanna #2	R&PP Sheridan	PRLA Wildcat	Hanna #8	Hanna #9
Survey Period - 1979	5/30-8/30	5/30-6/6	6/13-6/30 9/19-9/26	7/1-7/3 7/11-7/13	7/14-8/1	8/8-8/16	8/12-8/16 9/4-9/19
White-faced ibis *(Plegadis chihi)*	2						
American avocet *(Recurvirostra americana)*	1						
Mountain plover *(Charadrius montanus)*			1*				
Common flicker *(Colaptes auratus)*	1	1			1		
Western kingbird *(Tyrannus verticalis)*	1				1*		
Say's phoebe *(Sayornis saya)*	1				1		
Unidentified flycatcher	1						
Horned lark *(Eremophila alpestris)*	1*	1	1*			1	1
Cliff swallow *(Petrochelidon pyrrhonota)*	1						
Tree swallow *(Iridoprocne bicolor)*	1						
Pinyon jay *(Gymnorhinus cyanocephalus)*	1						1
Black-billed magpie *(Pica pica)*	1						
Rock wren *(Salpinctes obsoletus)*	1		1				
Sage thrasher *(Oreoscoptes montanus)*	1		1				1
American robin *(Turdus migratorius)*	1						
Mountain bluebird *(Sialia currucoides)*	1					1	
Killdeer *(Charadrius vociferus)*	1			1	1*		
Long-billed curlew *(Numenius americanus)*				1			
Solitary sandpiper *(Tringa solitaria)*					1		
Spotted sandpiper *(Actitis macularia)*	1						
Unidentified gull	1		1				

Table 3. (Continued)

Area	South Haystack	China Butte	Hanna #2	R&PP Sheridan	PRLA Wildcat	Hanna #8	Hanna #9
Survey Period - 1979	5/30-8/30	5/30-6/6	6/13-6/30 9/19-9/26	7/1-7/3 7/11-7/13	7/14-8/1	8/8-8/16	8/12-8/16 9/4-9/19
Mourning dove *(Zenaida macroura)*	1						
Great horned owl *(Bubo virginianus)*	1*	1*	1*				1*
Long-eared owl *(Asio otus)*	1*						
Short-eared owl *(Asio flammeus)*	1*				1*		
Burrowing owl *(Speotyto cunicularia)*	1*	1*	1*	1*			1*
Poor-will *(Phalaenoptilus nuttallii)*	1*	1*					1*
Common nighthawk *(Chordeiles minor)*	1*	1*			1*	1*	1*
Unidentified hummingbird	1						
Loggerhead shrike *(Lanius ludovicianus)*	1*		1*		1	1*	1
Starling *(Sturnus vulgeris)*	2						
Wilson's warbler *(Wilsonia pusilla)*	1						
Western meadowlark *(Sturnella neglecta)*	1*						
Yellow-headed blackbird *(Xanthocephalus xanthocephalus)*	1						
Red-winged blackbird *(Agelaius phoeniceus)*	1						
Brewer's blackbird *(Euphagus cyanocephalus)*	1						
Green-tailed towhee *(Chlorura chlorura)*	1						
Lark bunting *(Calamospiza melanocorys)*	1						
Vesper sparrow *(Pooecetes gramineus)*	1						1
Sage sparrow *(Amphispiza belli)*	1						
Brewer's sparrow *(spizella breweri)*	1						
N =	54	10	18	6	14	8	17

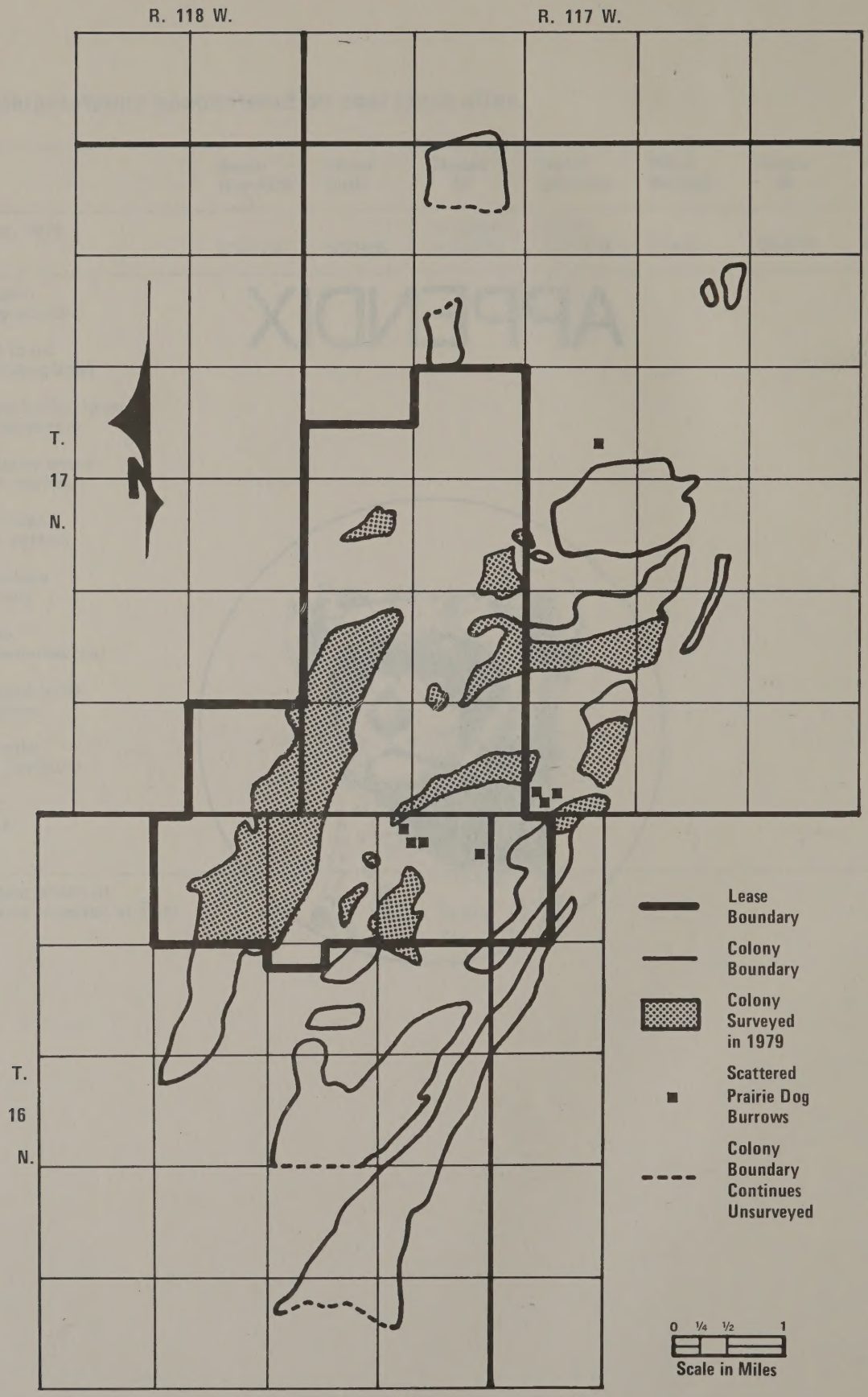
1 Birds observed
2 Skeleton found
* Birds observed at night

Table 4. Herpetofauna encountered on coal lease sites.

Area	South Haystack	China Butte	Hanna #2	R&PP Sheridan	PRLA Wildcat	Hanna #8	Hanna #9
Survey Period - 1979	5/30-8/30	5/30-6/6	6/13-6/30 9/19-9/26	7/1-7/3 7/11-7/13	7/14-8/1	8/8-8/16	8/12-8/16 9/4-9/19
Sagebrush lizard *(Sceloporus graciosus)*	1						
Short-horned lizard *(Phrynosoma douglassi)*	1					1*	1
Eastern yellow-bellied racer *(Coluber c. flaviventris)*					1		
Wandering garter snake *(Thamnophis vagrans)*	1				1		
Plains garter snake *(Thamnophis sirtalis)*					1		
Prairie rattlesnake *(Crotalus viridis)*			1		1		1
Gopher snake *(Pituophis melanoleucus)*					1		
Western painted turtle *(Chrysemys picta)*					1		
Tiger salamander *(Ambystoma tigrinum)*					1		1
Leopard frog *(Rana pipiens)*					1		
N =	3		1		8	1	3

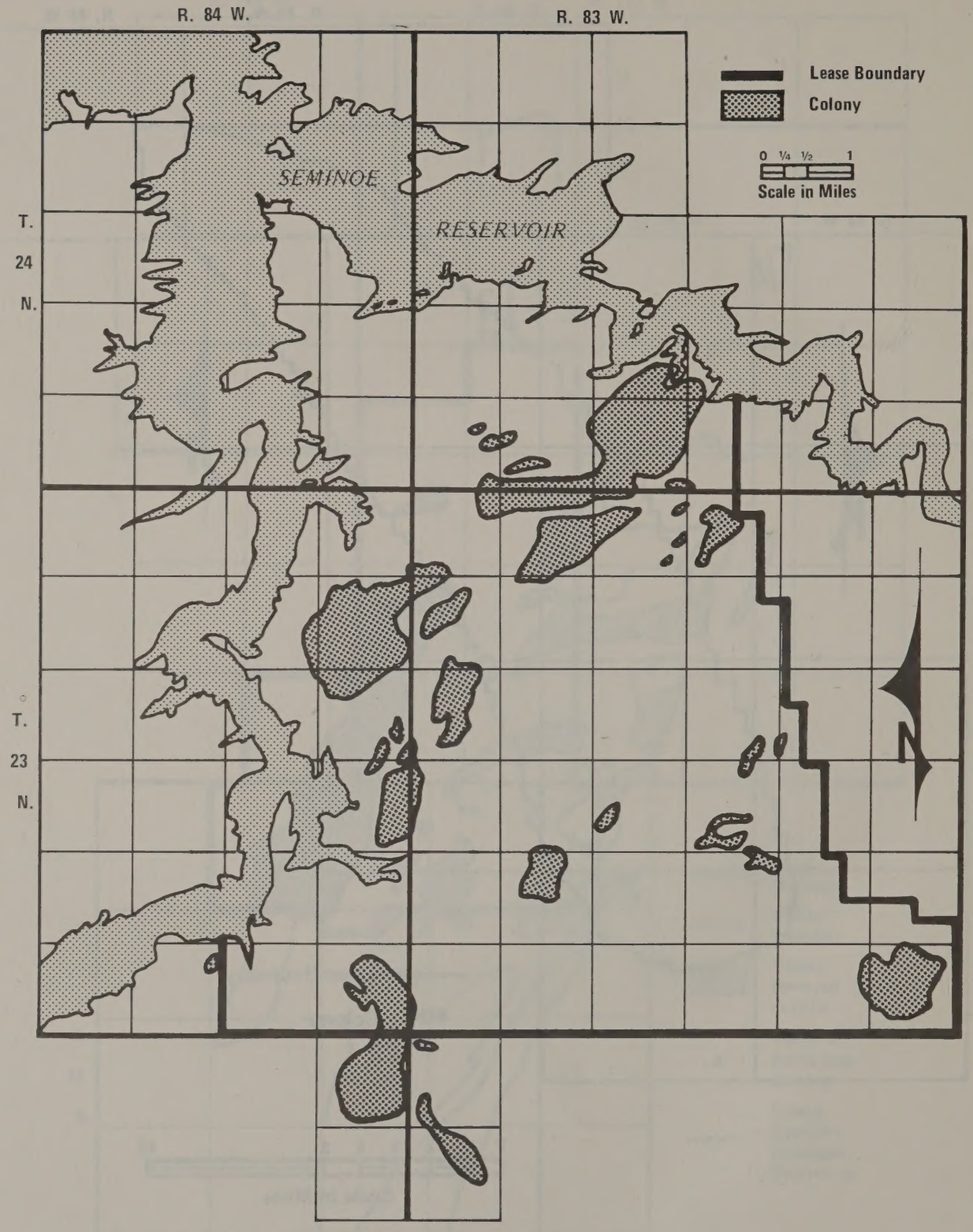
1 Herpetofauna observed
* Herpetofauna observed at night

APPENDIX

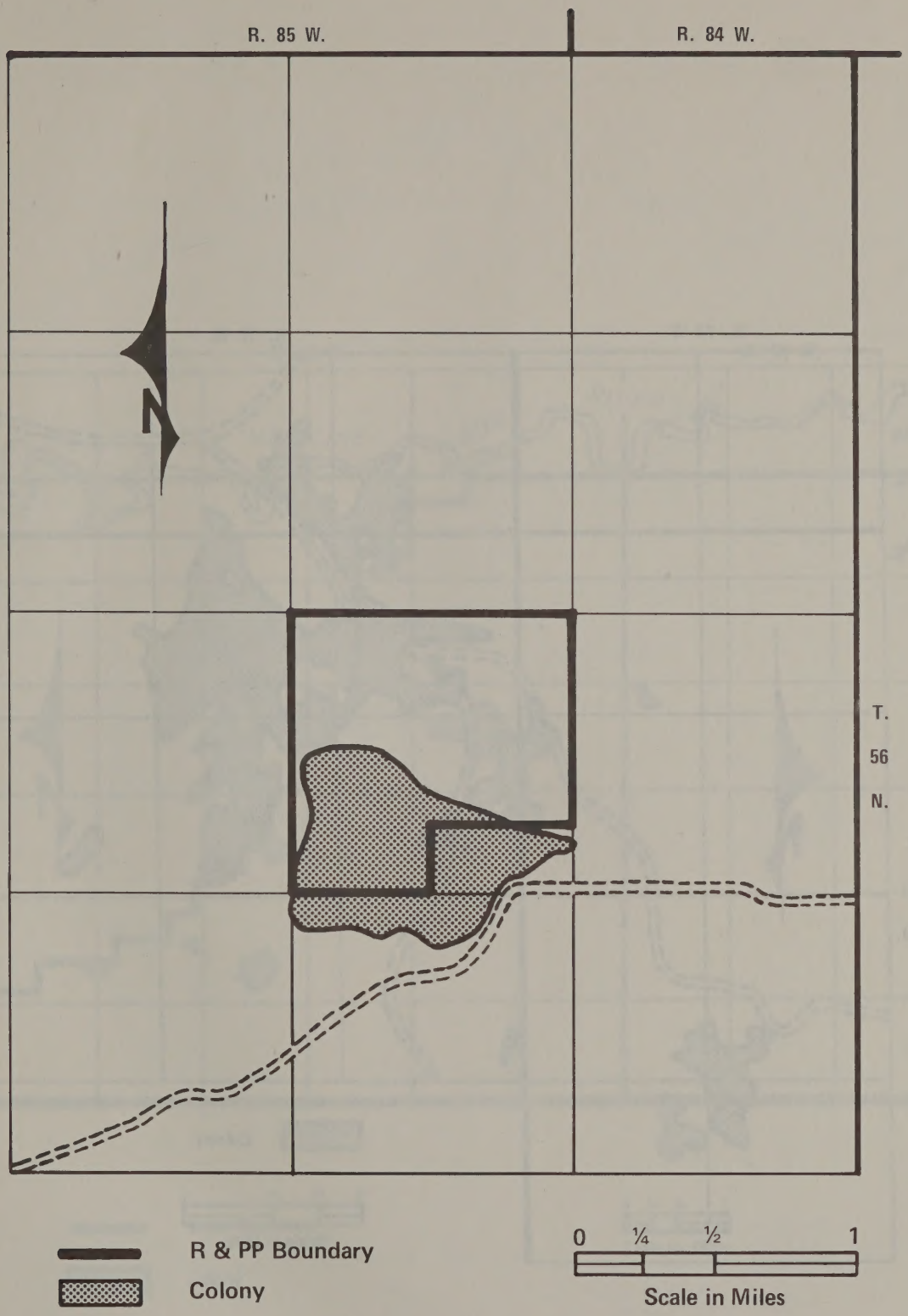


Map 1
SOUTH HAYSTACK

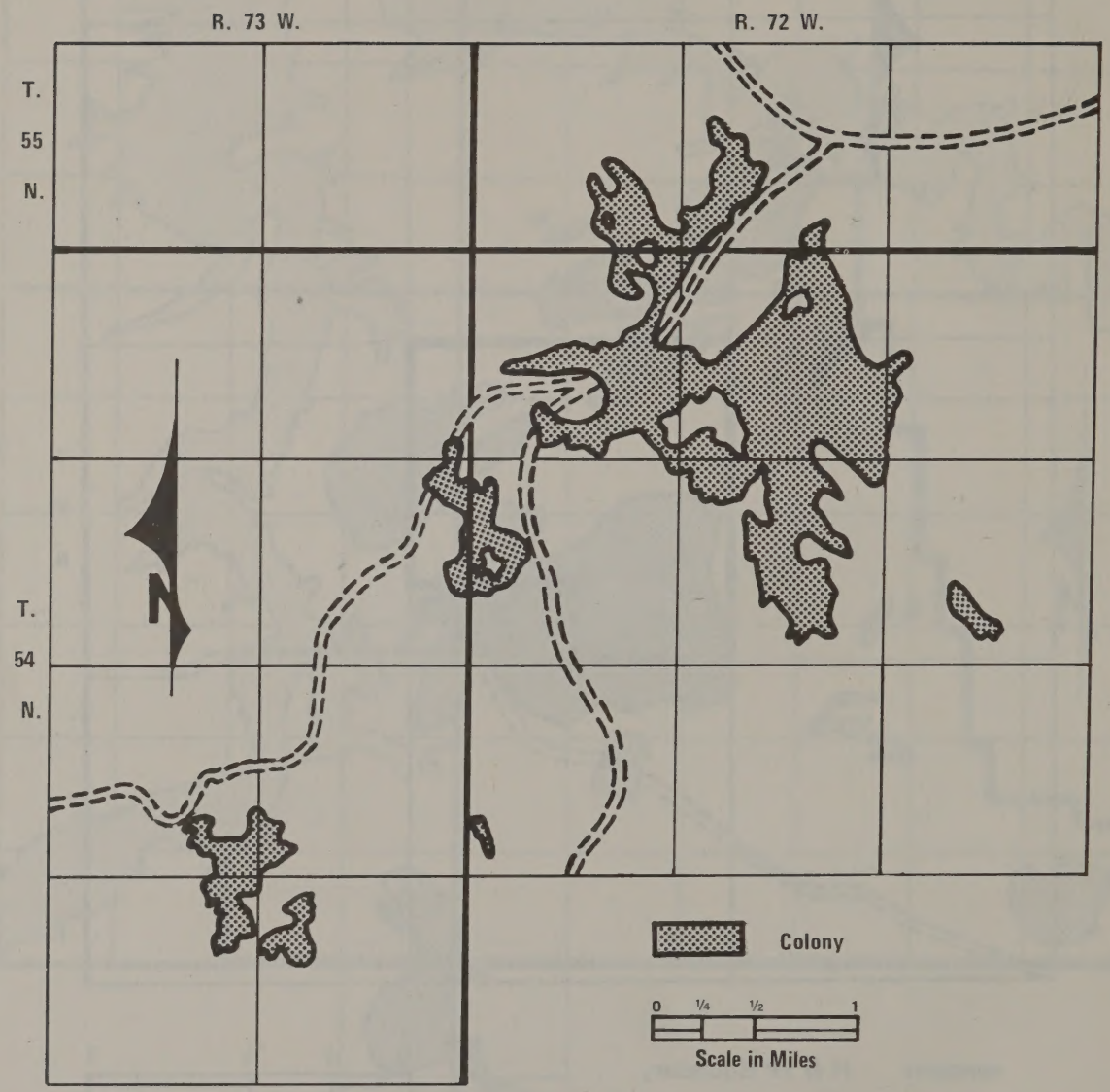
Map 2
CHINA BUTTE


R. 84 W.
R. 83 W.
Lease Boundary
Colony
0 ¼ ½ 1
Scale in Miles
SEMINOE
RESERVOIR
T.
24
N.
T.
23
N.

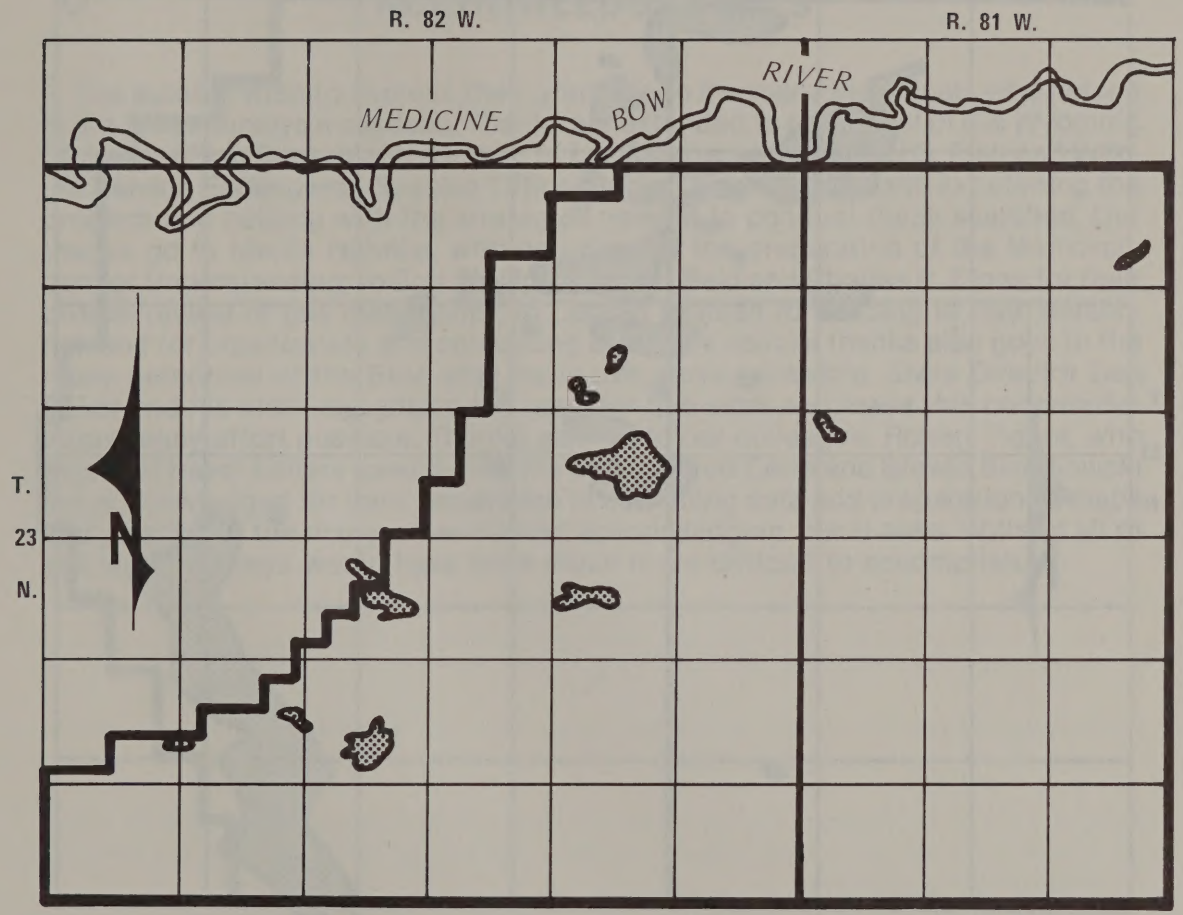
Map 3
HANNA 2



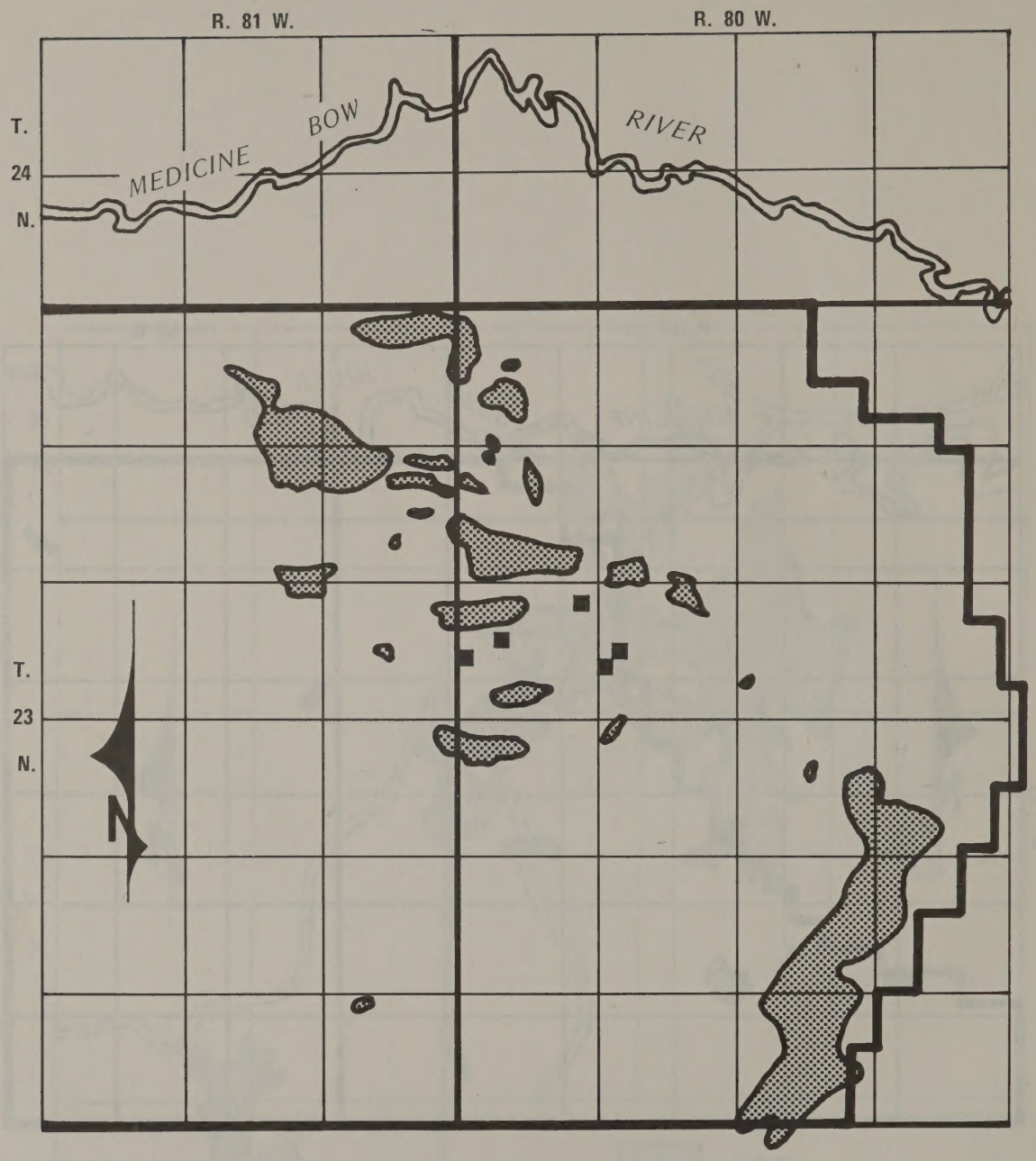
Map 4
R & PP-SHERIDAN



Map 5
PRLA WILDCAT


R. 82 W.
R. 81 W.
MEDICINE BOW RIVER
T.
23
N.
N
Lease Boundary
Colony
0 1/4 1/2 1
Scale in Miles

Map 6
HANNA 8


R. 81 W.
R. 80 W.
T.
24
N.
MEDICINE BOW RIVER
T.
23
N.
N
Lease Boundary
Colony
Scattered Prairie Dog Burrows
0 1/4 1/2 1
Scale in Miles

Map 7
HANNA 9

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